

The USDA Climate Hubs

Managing California's Forests in a Future with Climate Change, Insects and Wildfire

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USDA California Climate Hub



United States Department of Agriculture
California Climate Hub



Climate Change and Forest Management

For the first time in the history of natural resource management, global stressors including *Climate Change* will have a greater effect in shaping our ecosystems than land use practices.

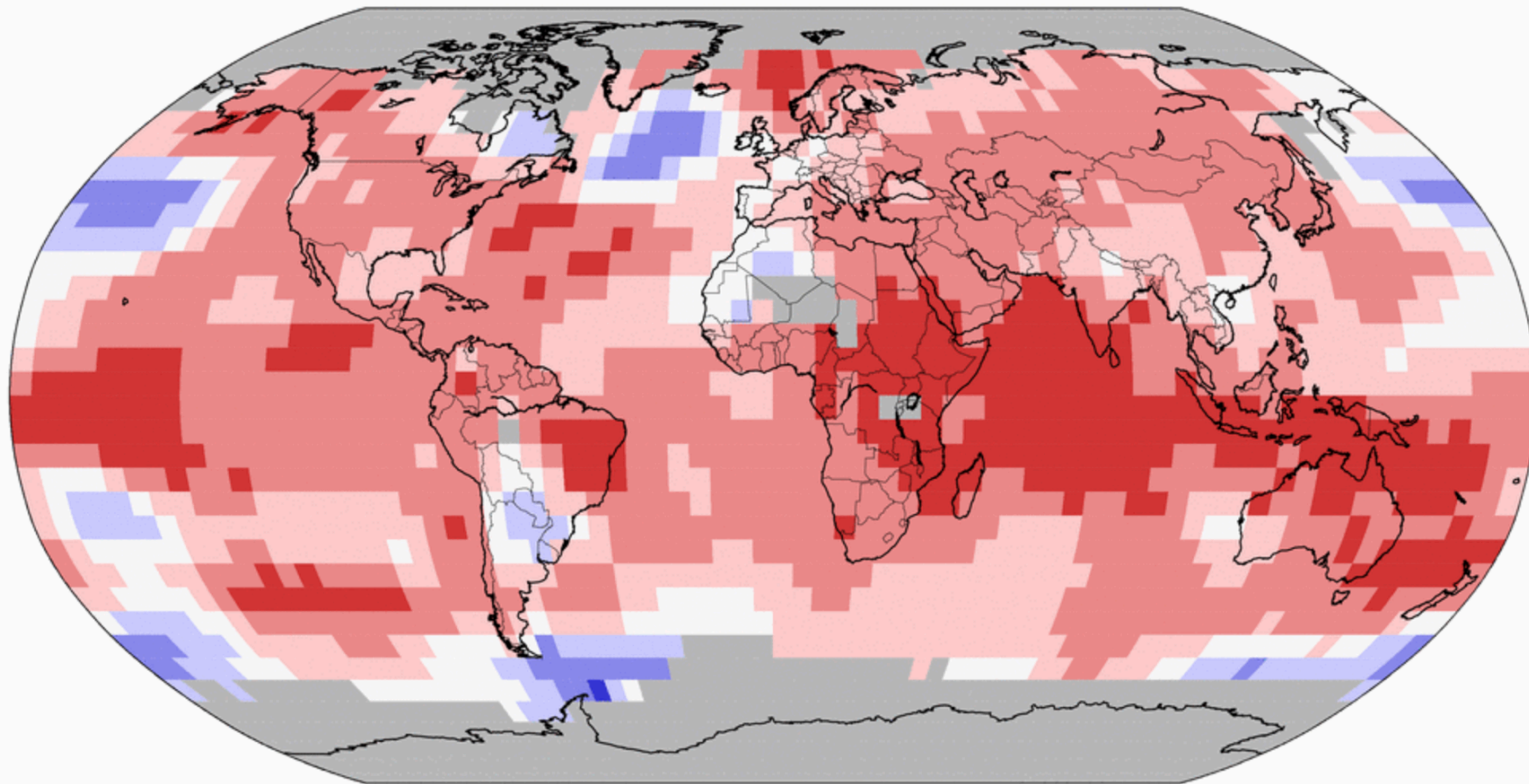


United States Department of Agriculture
California Climate Hub

Land & Ocean Temperature Percentiles Mar 2016

NOAA's National Centers for Environmental Information

Data Source: GHCN-M version 3.3.0 & ERSST version 4.0.0



**Record
Coldest**



**Much
Cooler than
Average**



**Cooler than
Average**



**Near
Average**



**Warmer than
Average**



**Much
Warmer than
Average**

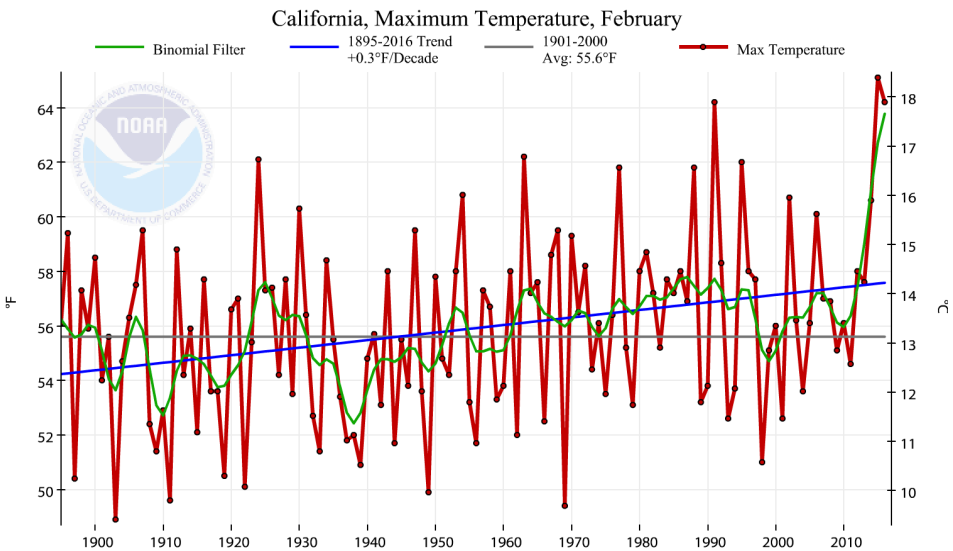


**Record
Warmest**

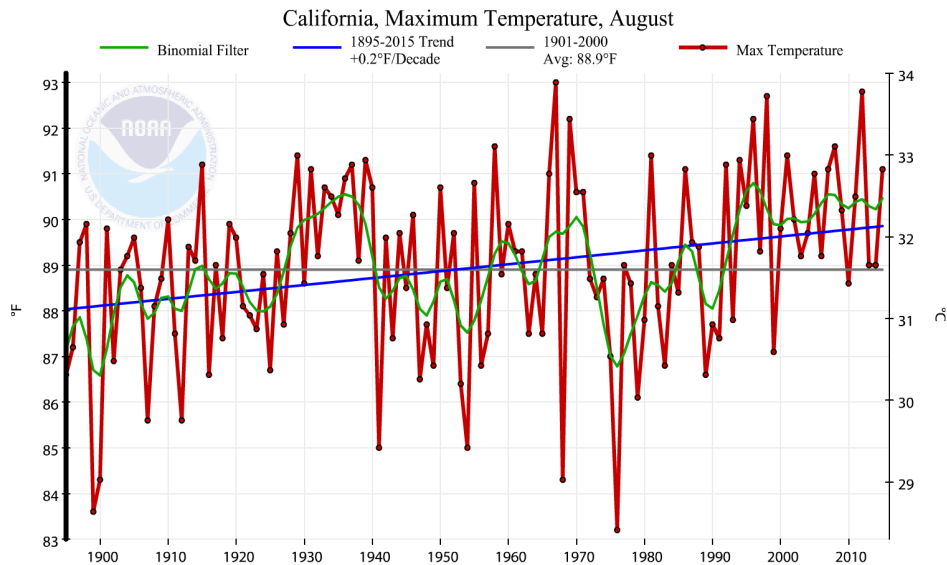


Fri Apr 15 07:06:08 EDT 2016

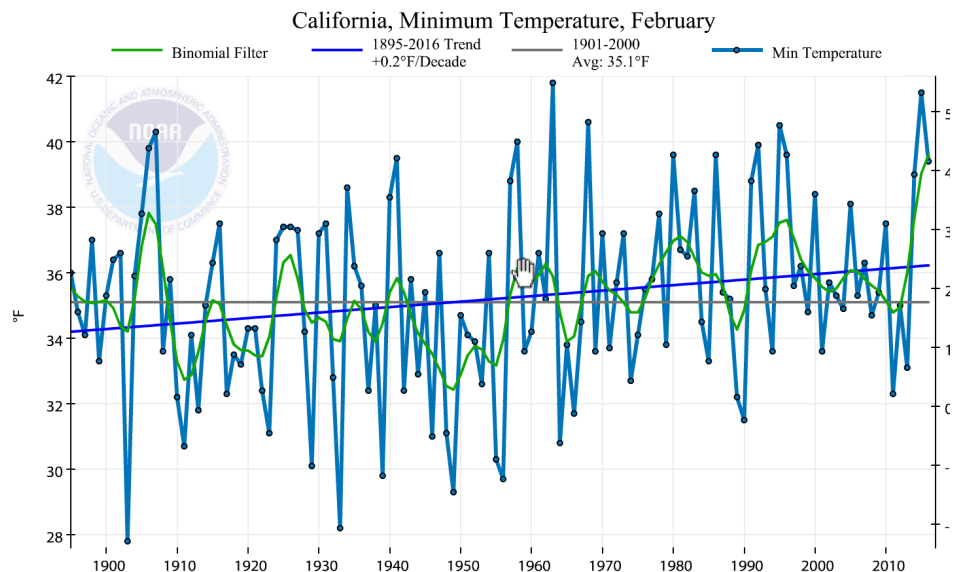
Winter High Temps + 0.3° F



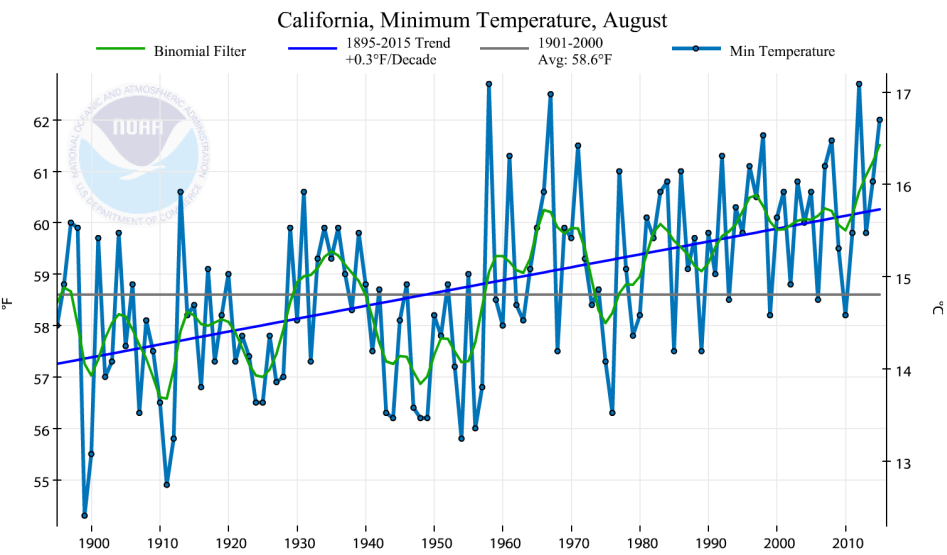
Summer High Temps + 0.2° F



Winter Low Temps + 0.2° F



Summer Low Temps + 0.3° F



Recent Climate Trends

- It's getting warmer, including at night
- Mean annual precipitation is decreasing at lower elevations (<7000 ft)
- Snowpack is declining (lower elevations)
- Increased inter annual variability
- Combination of these factors is resulting in drier summers

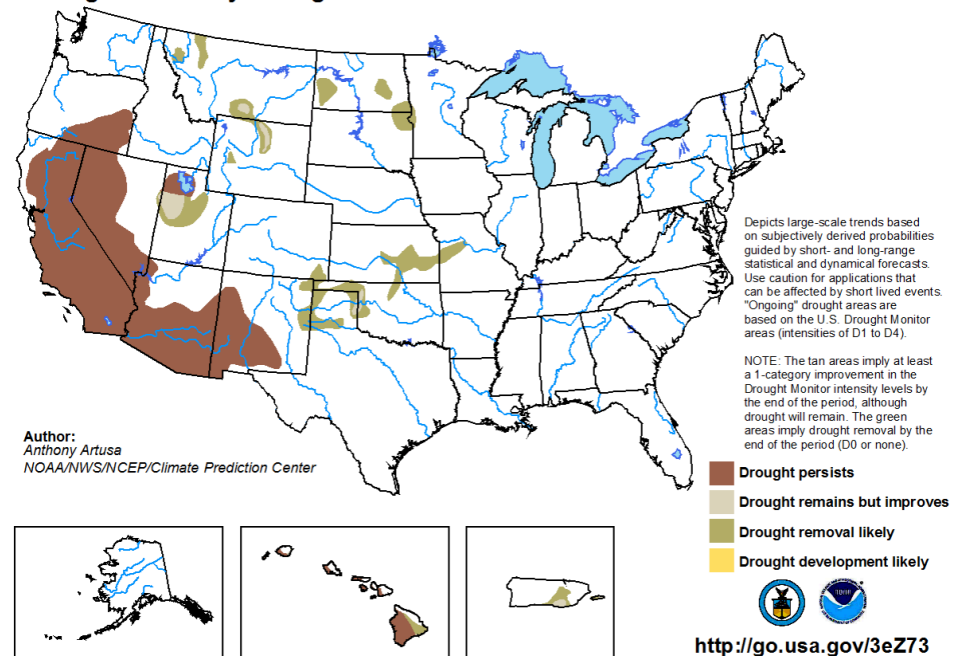


The Future

- Drought conditions persist

U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for April 21 - July 31, 2016
Released April 21, 2016



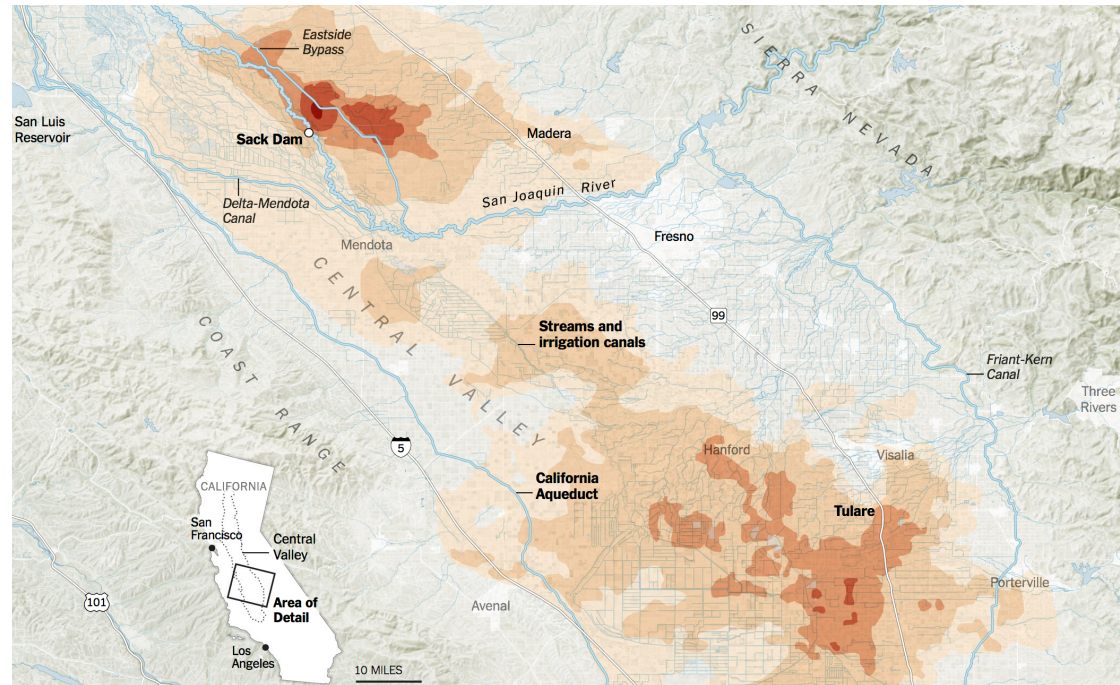
The Climate Prediction Center, part of the National Weather Service, publishes this outlook on the third Thursday of each month.
Click [here](http://go.usa.gov/3eZ73) for more information.

The Future

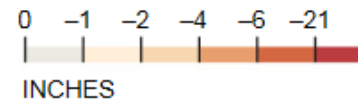
- Drought conditions persist
- Social/ecological/economic impacts

The Future

- Drought conditions persist
- Social/ecological/economic impacts
- Demand for water

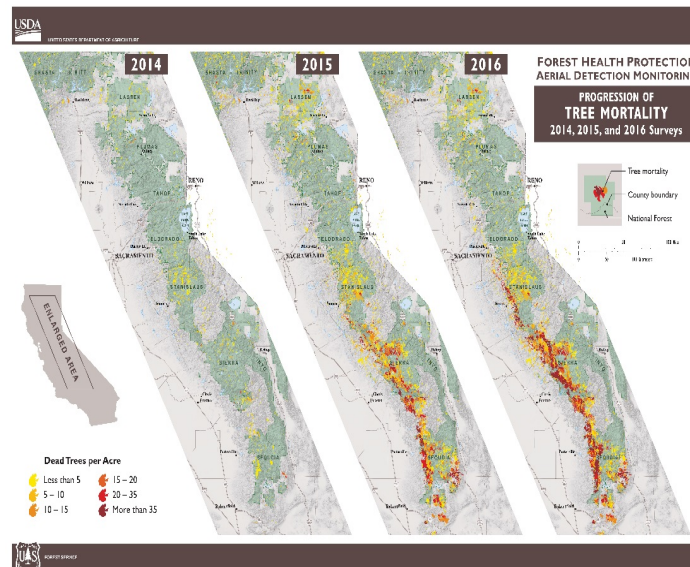


Change in height
of valley floor
over two years



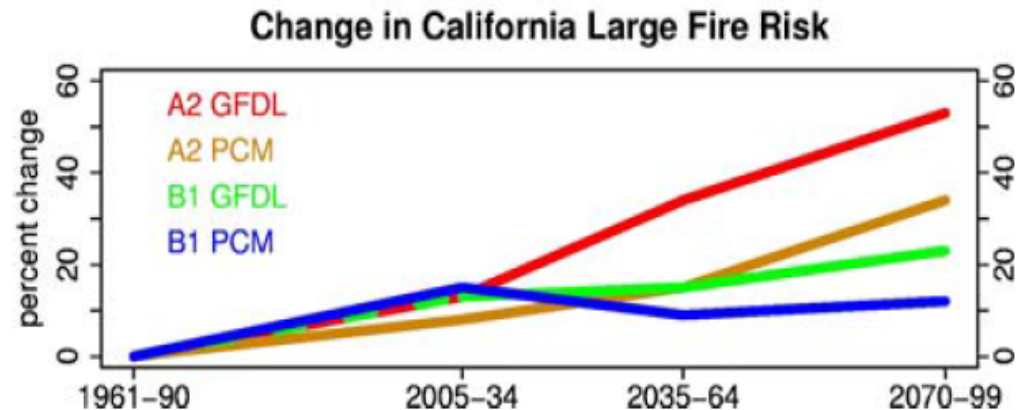
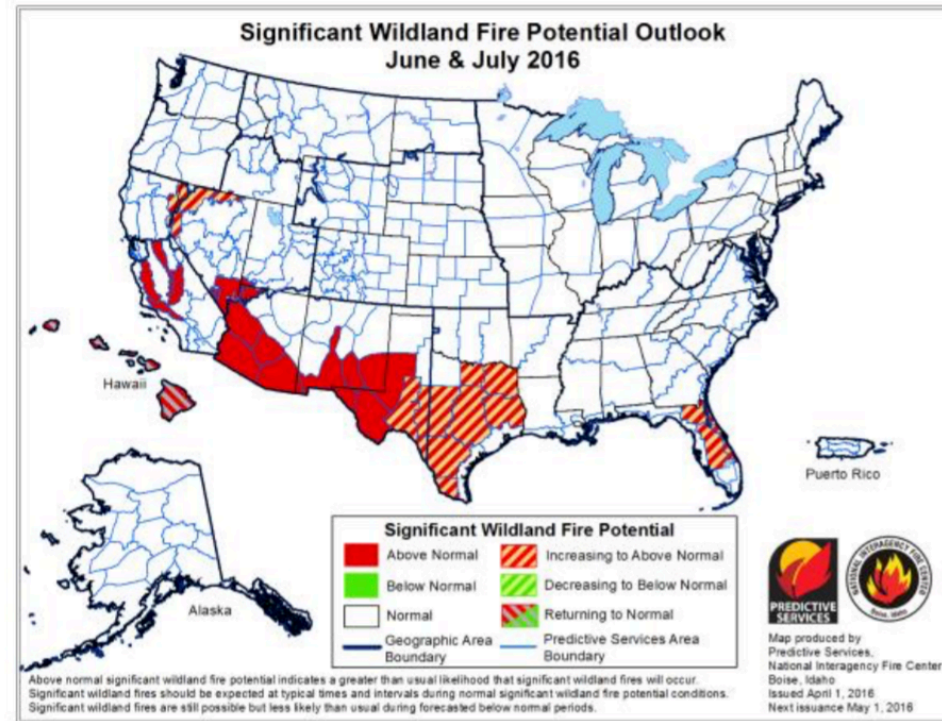
The Future

- Drought conditions persist
- Social/ecological/economic impacts
- Demand for water
- Forest health



The Future

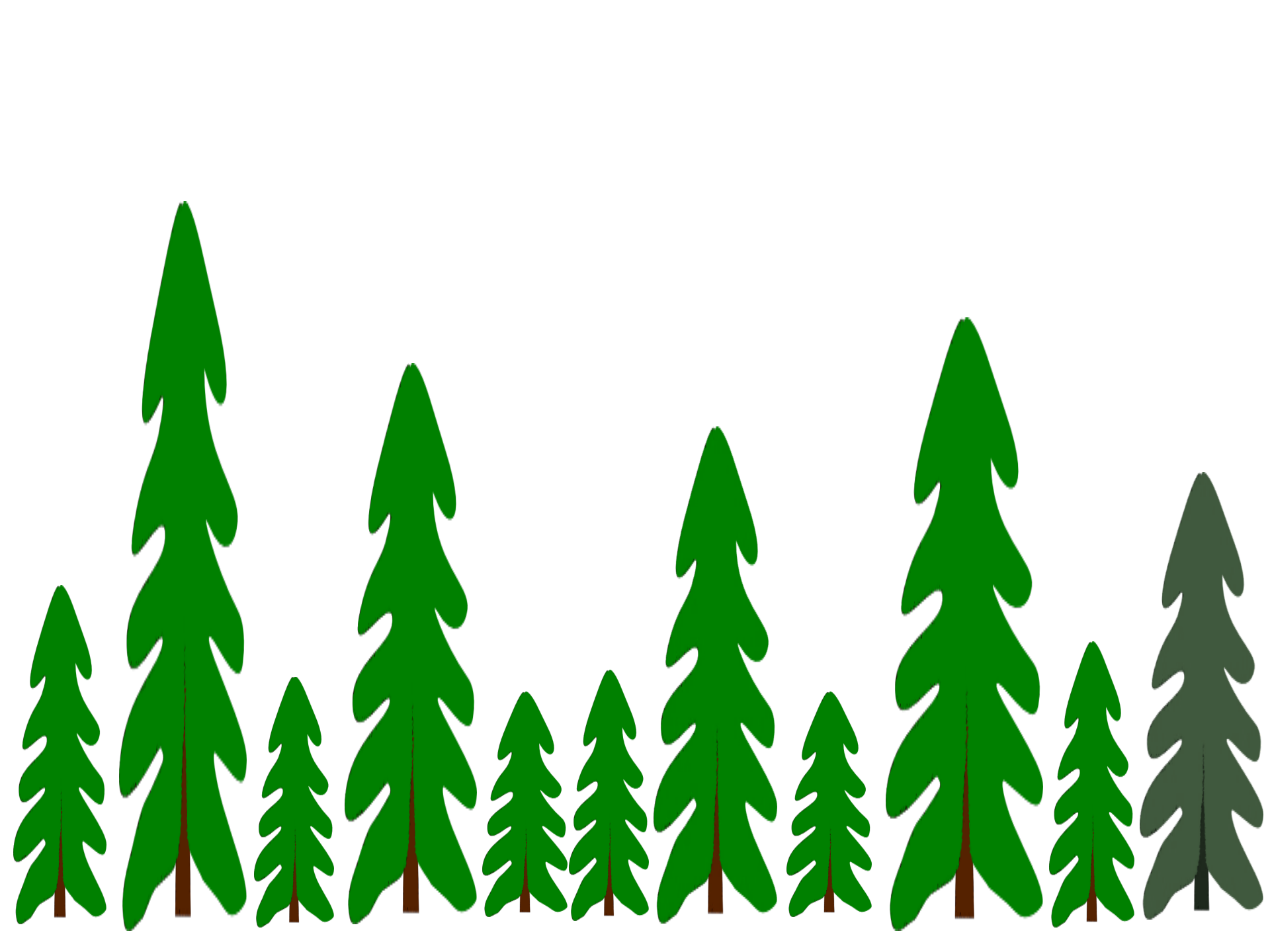
- Drought conditions persist
- Social/ecological/economic impacts
- Demand for water
- Forest health
- Fire outlook



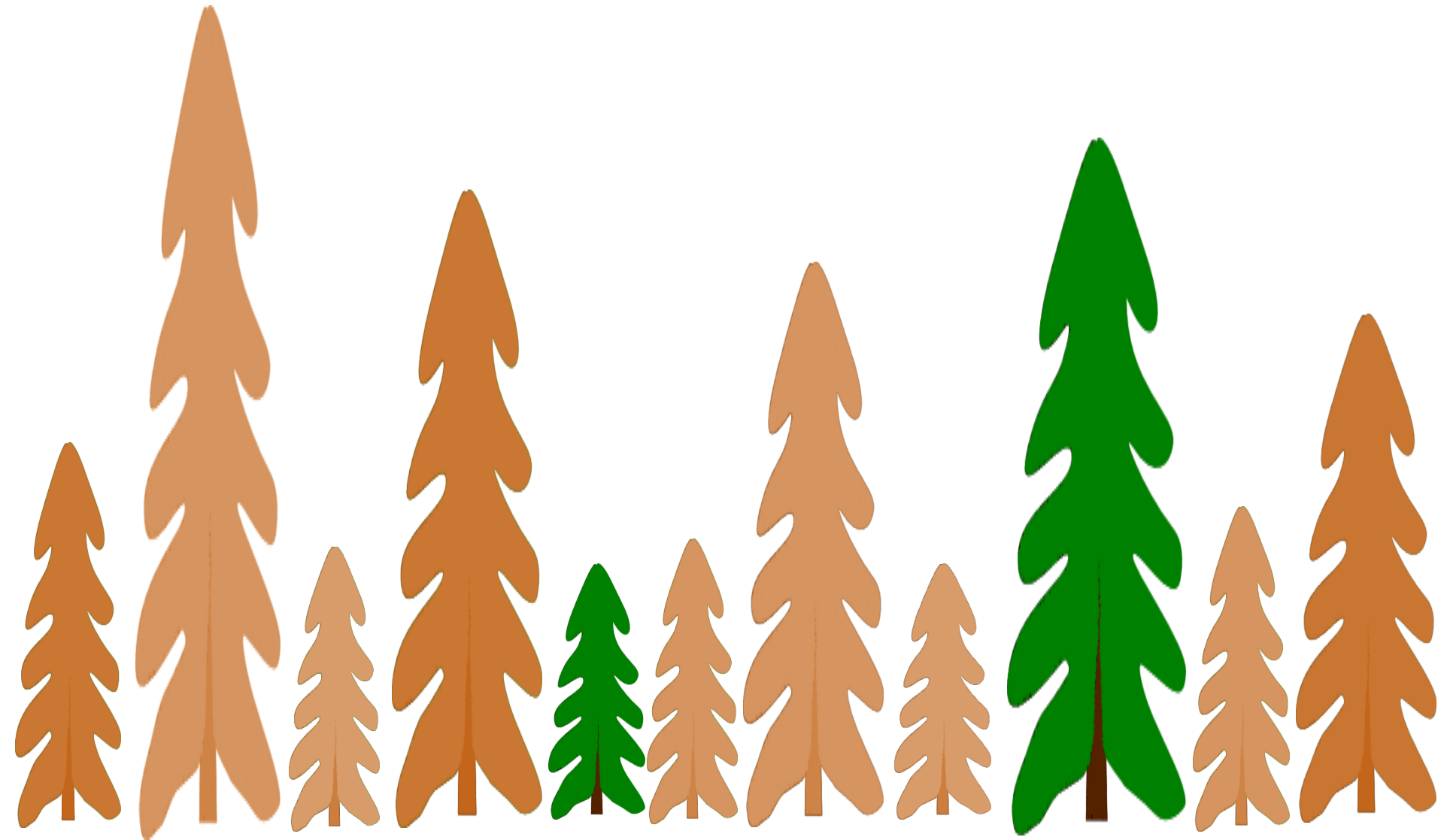
Westering and Bryant 2008 Climate Change

The Future

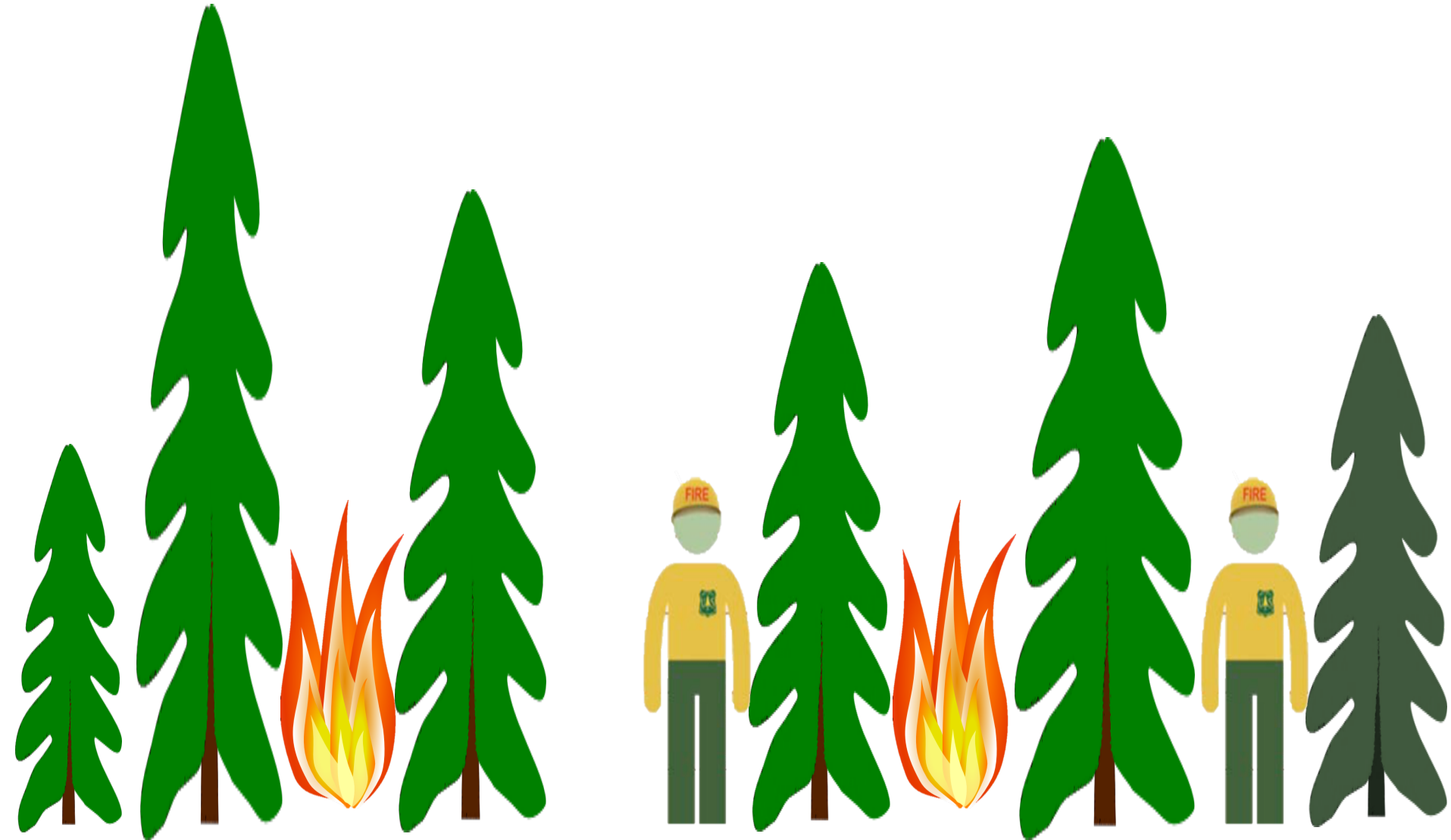
- Temperatures will increase
 - 3 to 4 ° F by 2030's
- Precipitation change
uncertain may increase in
CA
- More extreme wet and dry
years
- Snowpack will decline 20-
90%
- Larger, more severe fires



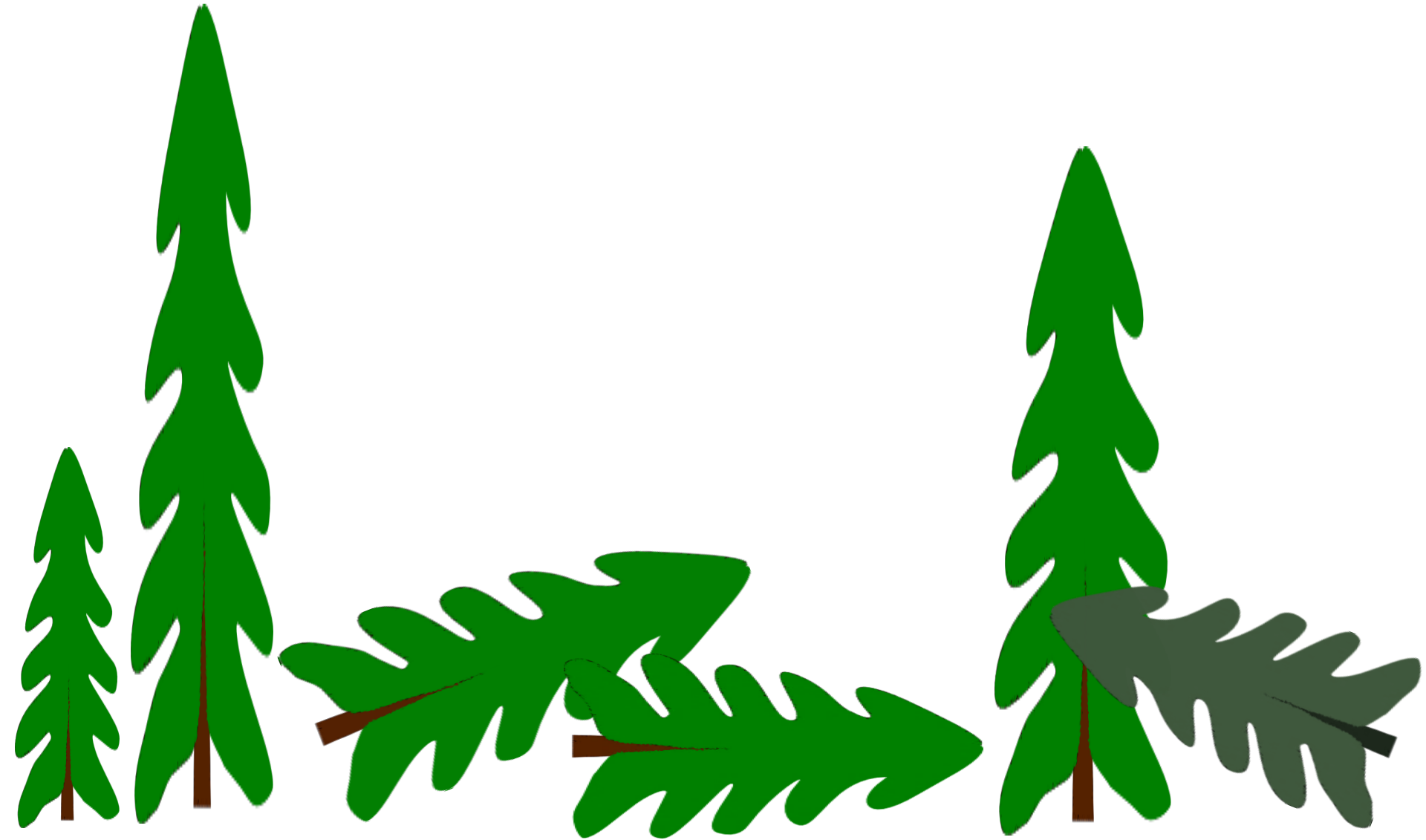
What Happened?



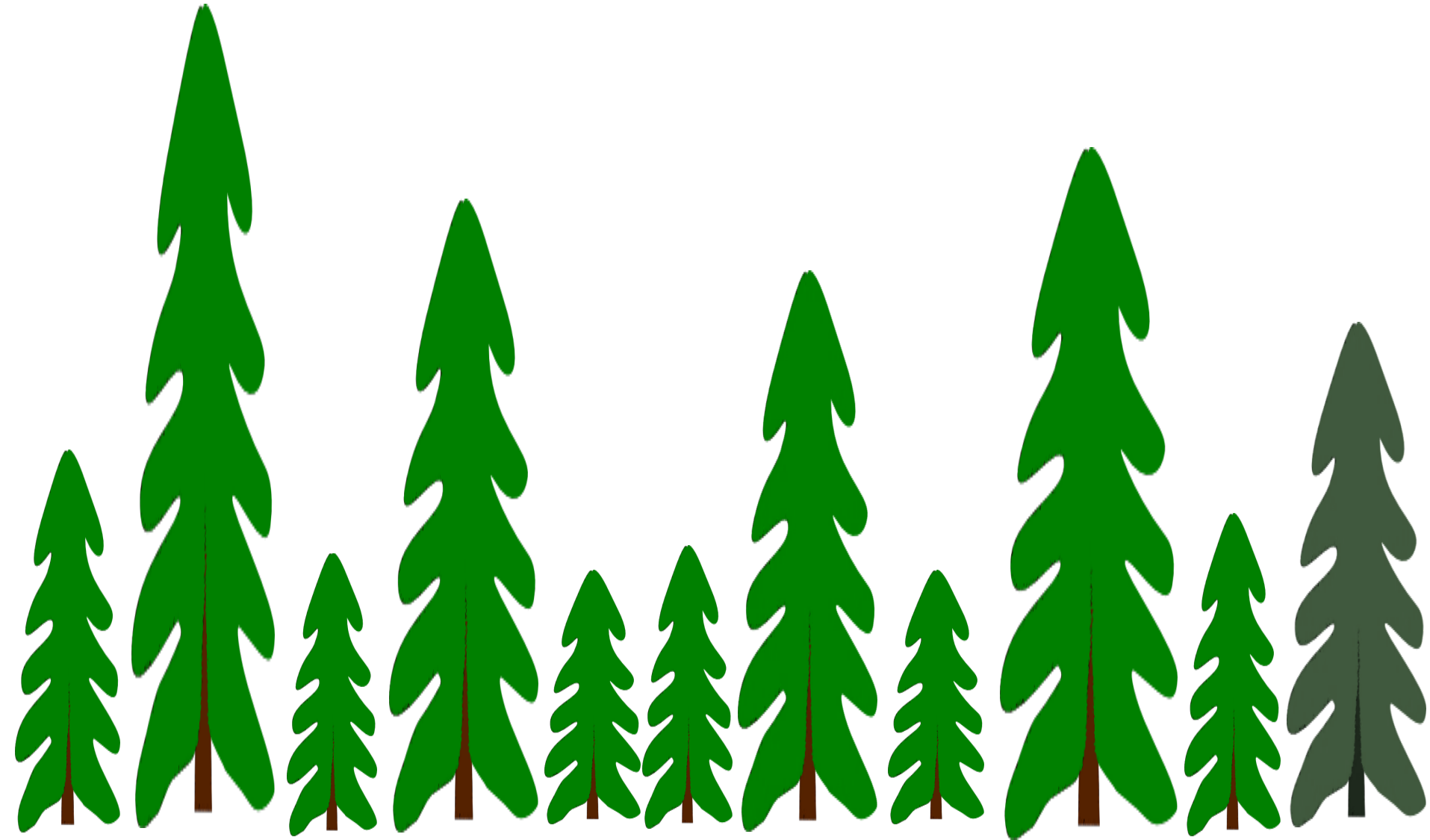
Fire Suppression



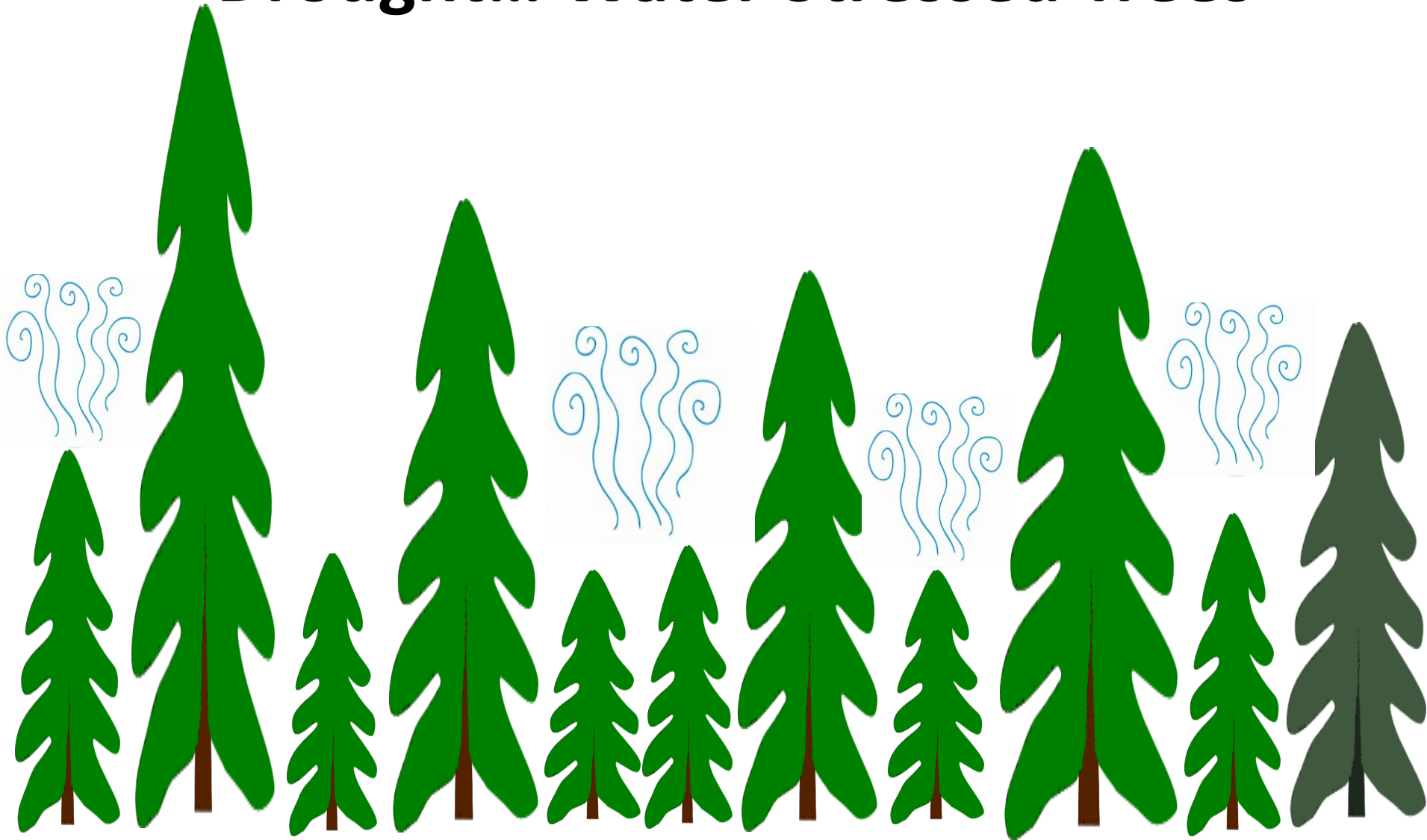
Land Management



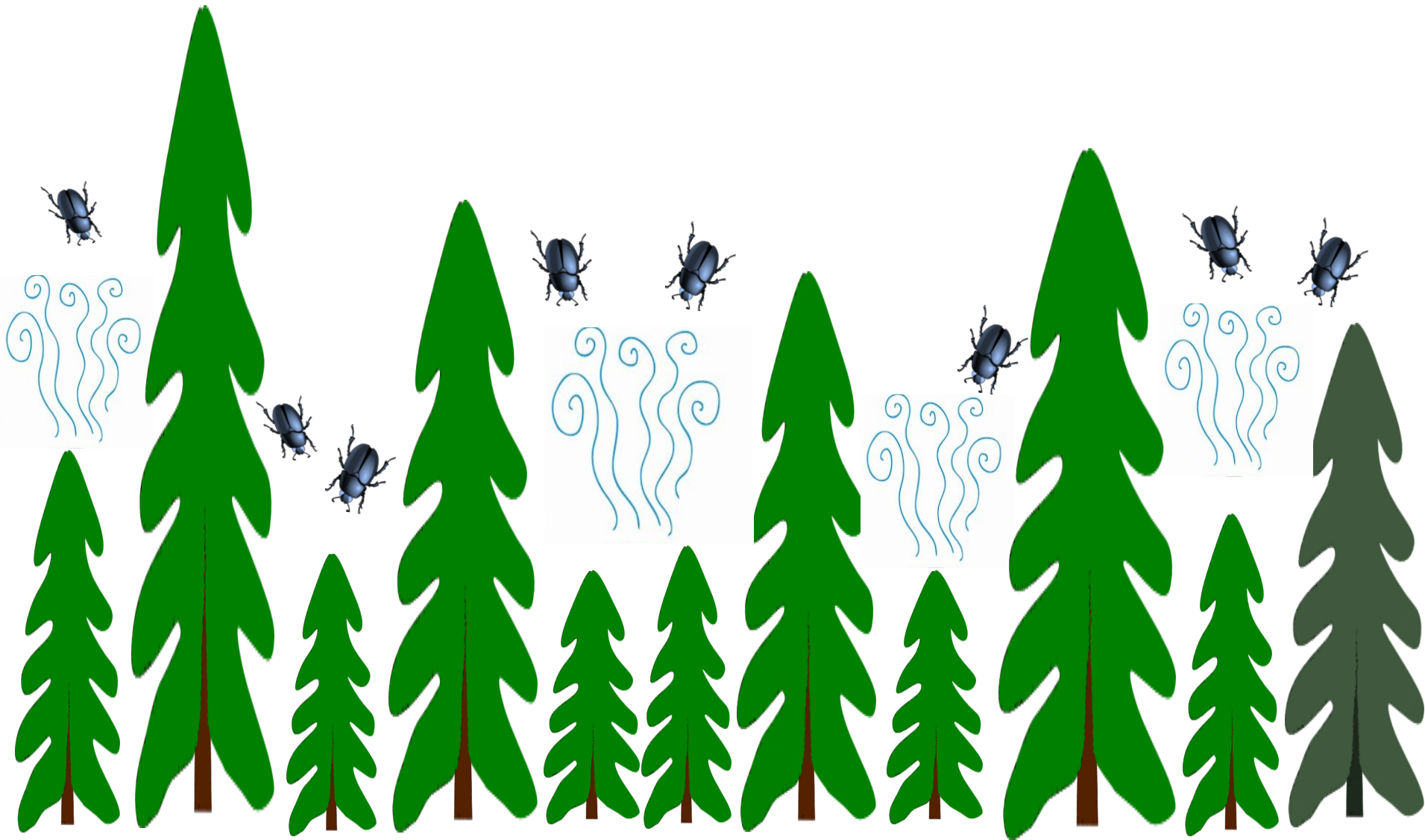
Densification



Climate Change, Warming, Drought... Water Stressed Trees

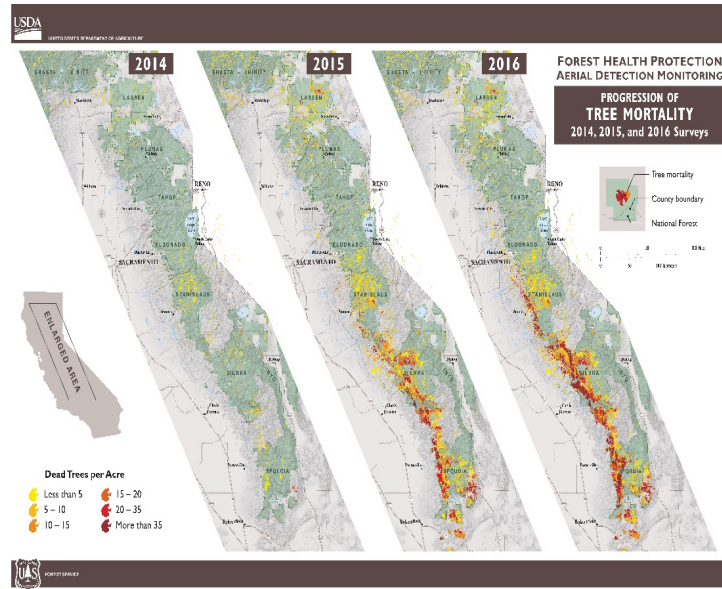


Beetle Response



66 Million Dead Trees and Counting as Conditions Continue to Change



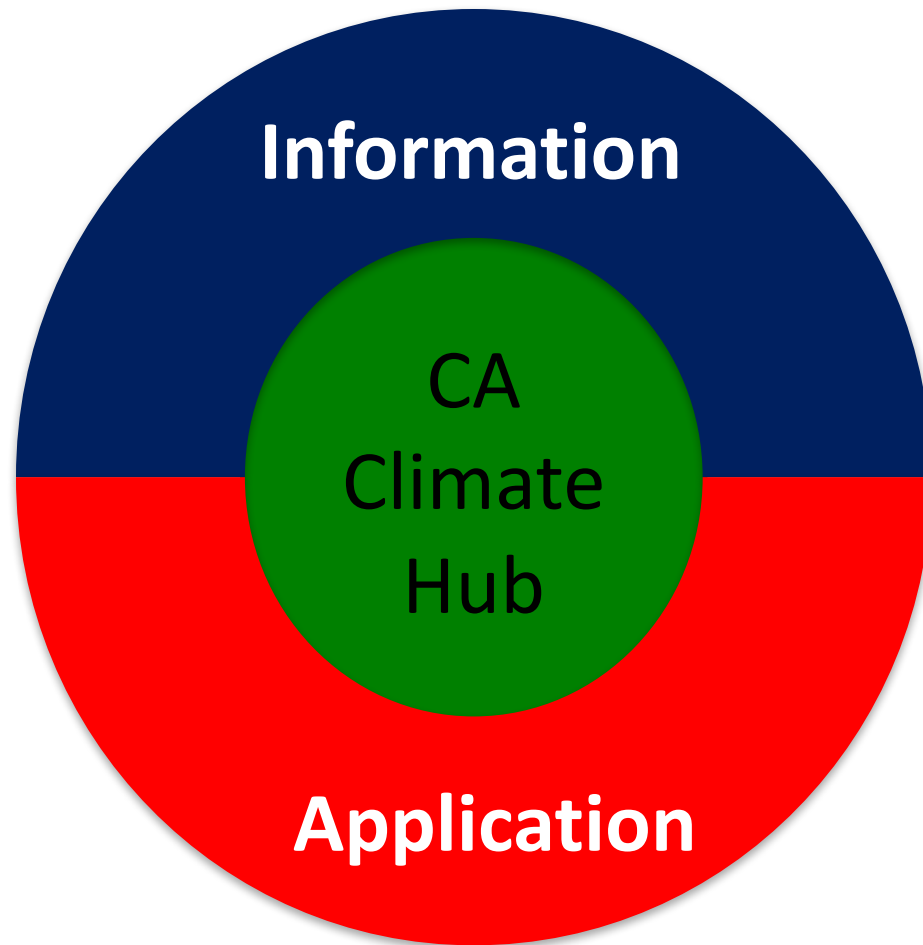


Forest	Est. Acres
Eldorado	105,000
LTBMU	17,000 ⁺
Sequoia	535,000
Sierra	554,000
Stanislaus	270,000
Tahoe	110,000
Total	1,591,000



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Science Community



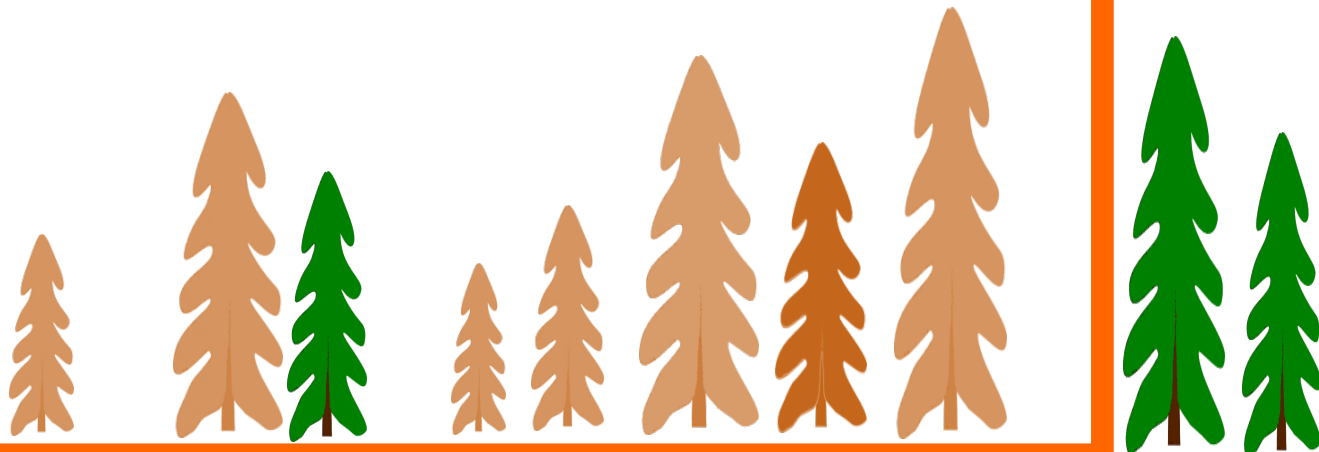
Resource Managers



United States Department of Agriculture
California Climate Hub

National Forest Unit

**~75% affected area
tree mortality**





**Hazard removal to protect
human safety and
property**

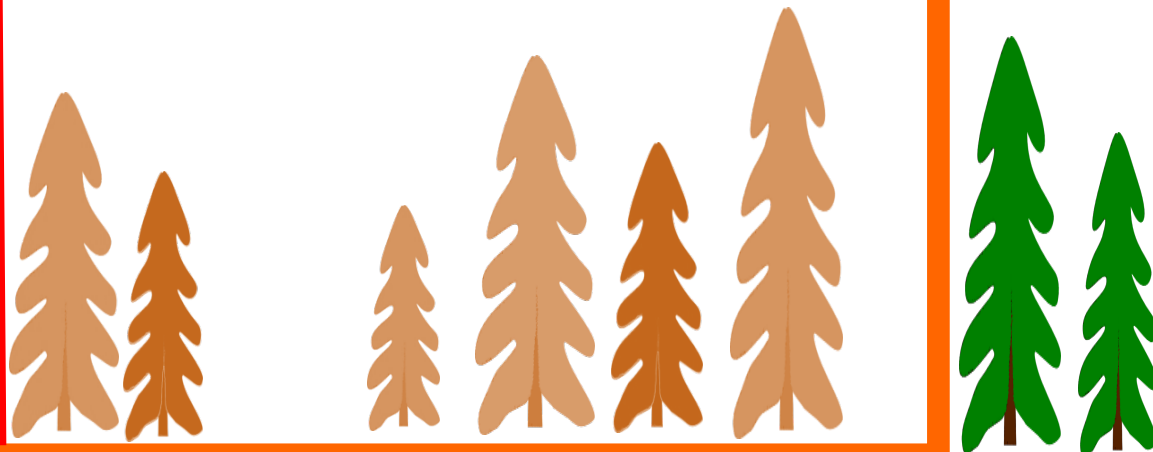


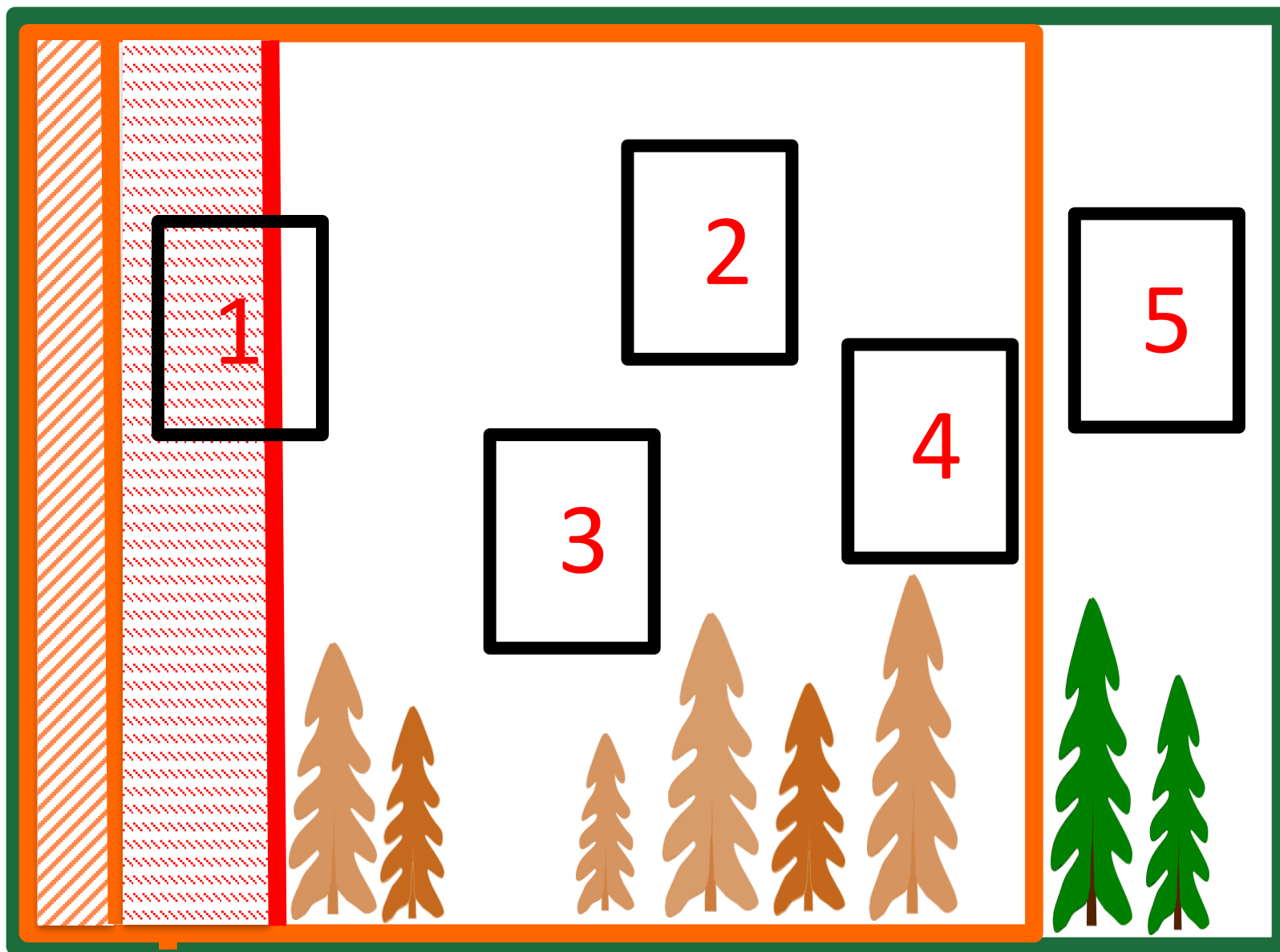
Wildfire





Affected by wildfire





Are we getting the greatest '*return*' per '*investment*' from our landscape ecological restoration treatments?

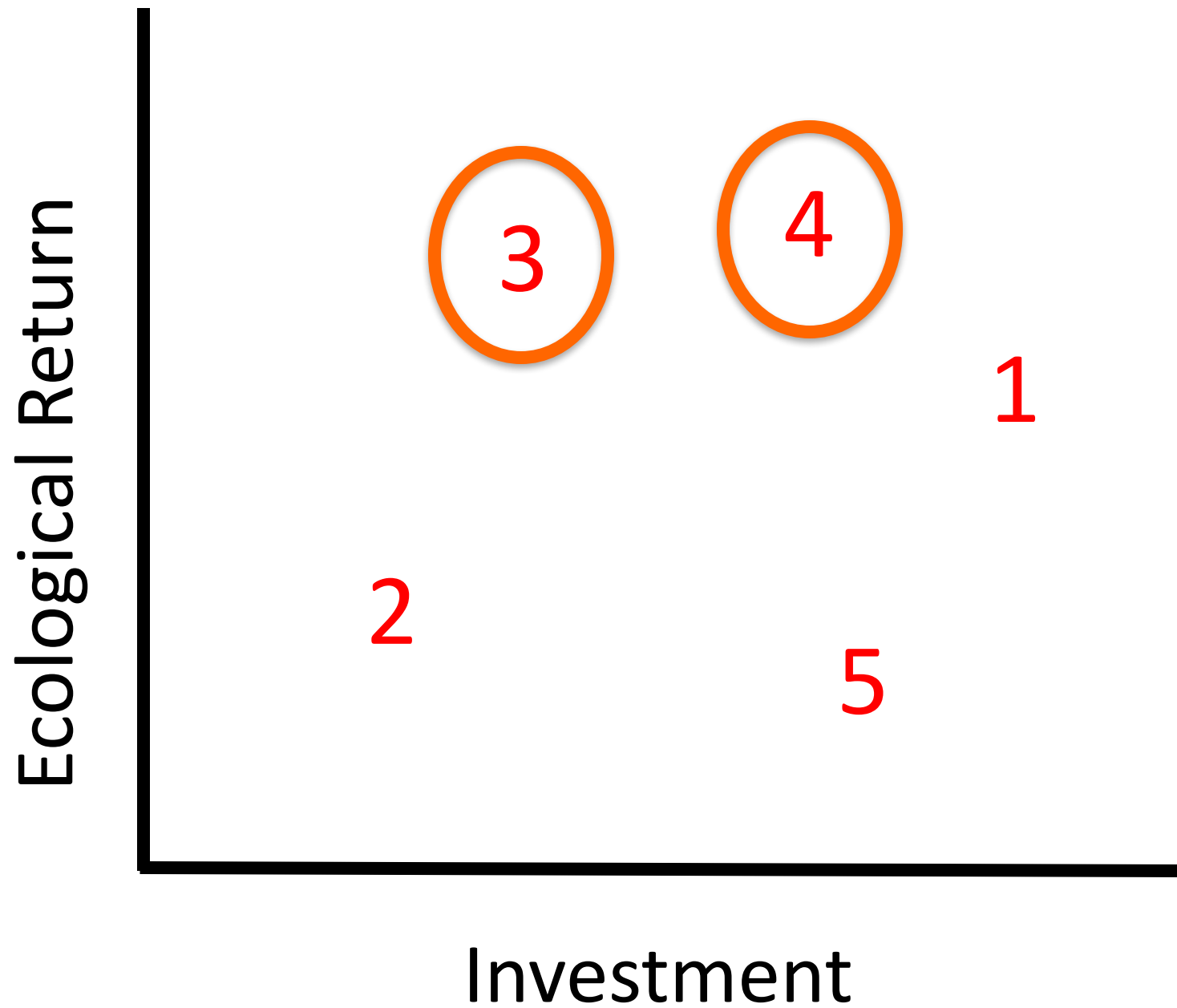
Are we getting the greatest '*return*' per '*investment*' from our landscape ecological restoration treatments?

Are we implementing actions that are not only supporting ecological *resiliency* today but are suitable in the face of *climate change*?

Are we getting the greatest '**return**' per '**investment**' from our landscape ecological restoration treatments?

Return: Sustained ecological return in the form of desired values (i.e. promoting resilient ecosystems for future generations)

Carbon Storage
Recreation
Water Storage & Delivery
Resiliency
Wildlife Habitat
Hydroelectric
Economic

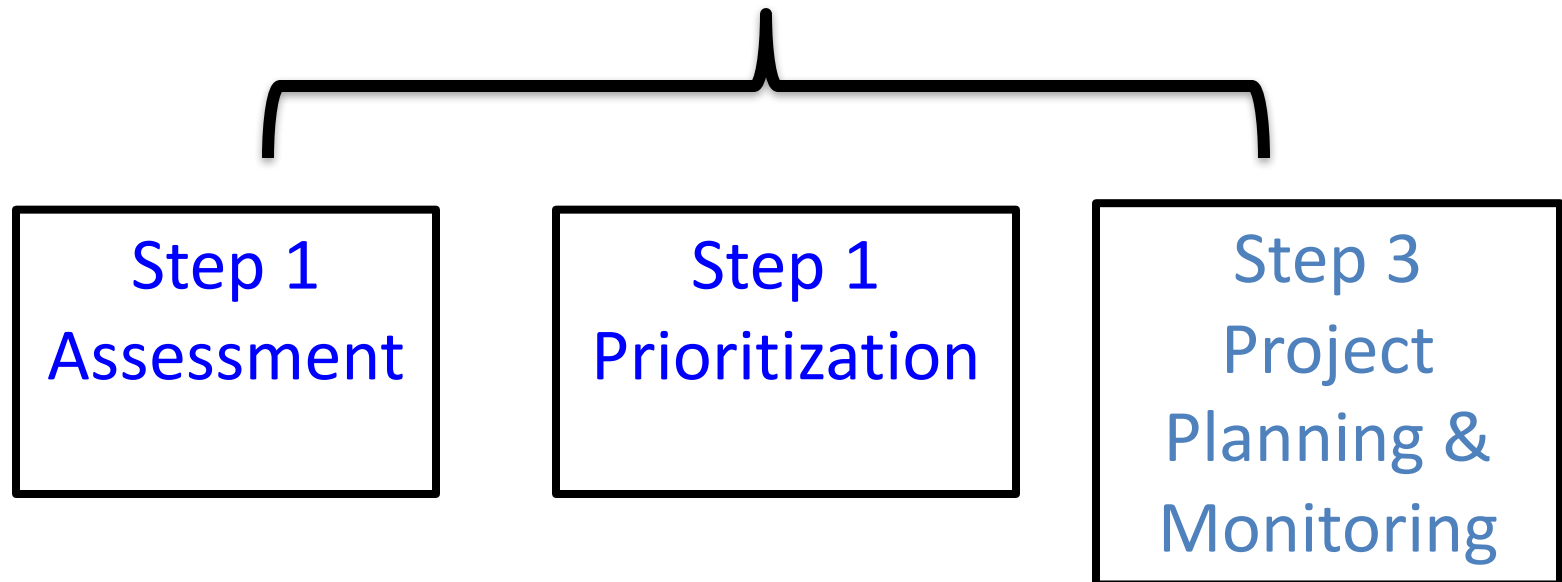


Unifying Principals

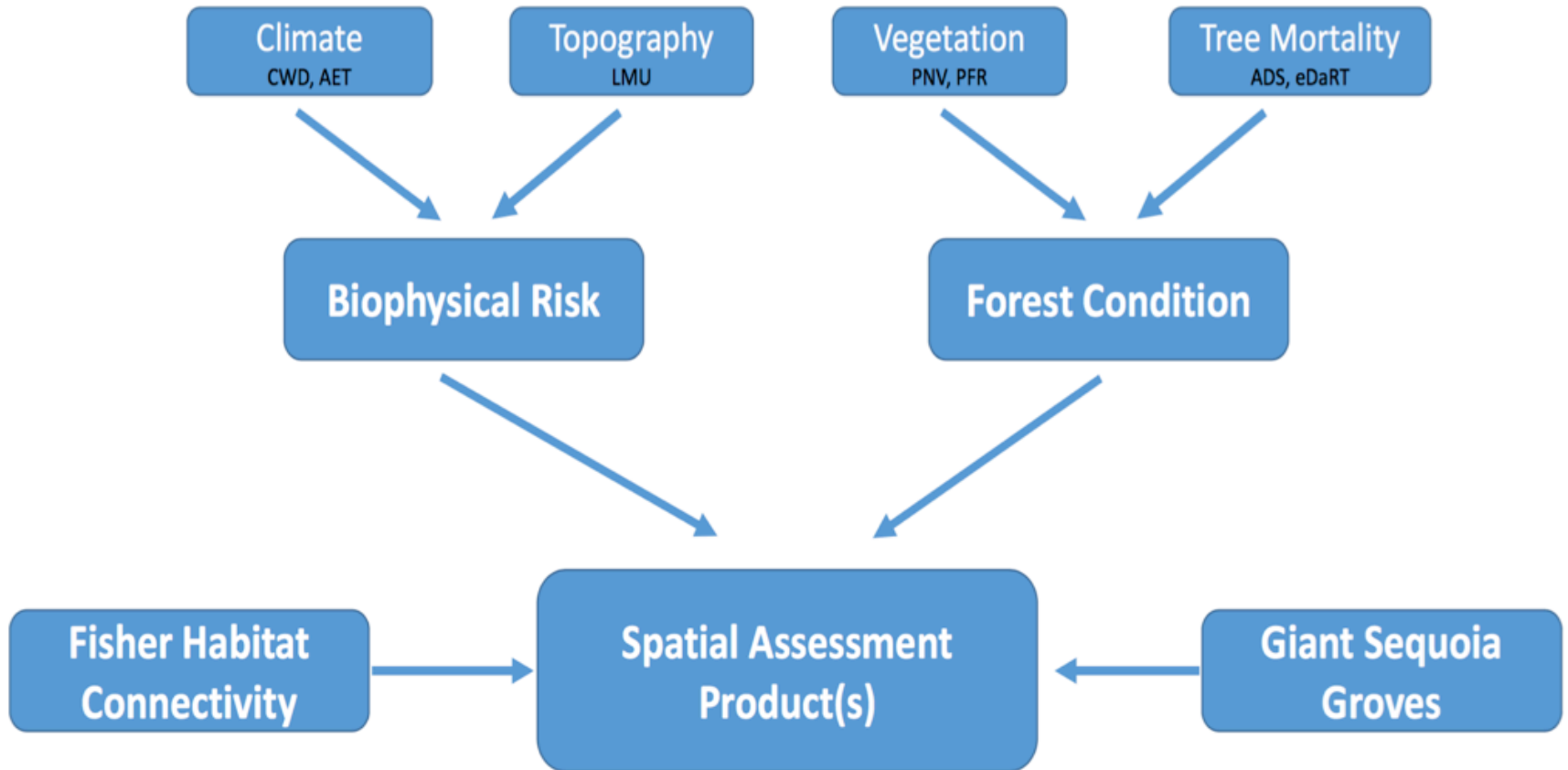
1. Relevant Landscape Context
2. Restoring Critical Ecological Processes
3. Supports Native Biodiversity
4. Sustains Ecosystem Services & Values
5. Incorporates Climate Change Adaptation

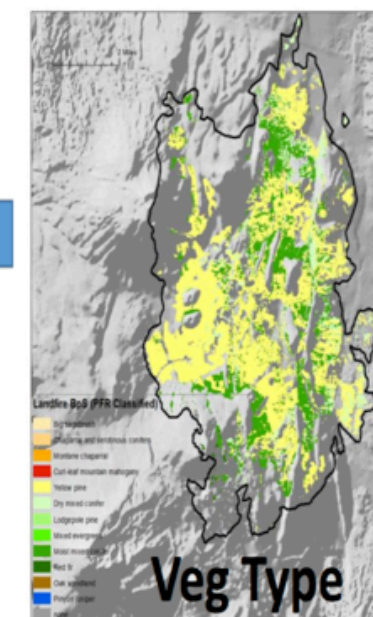
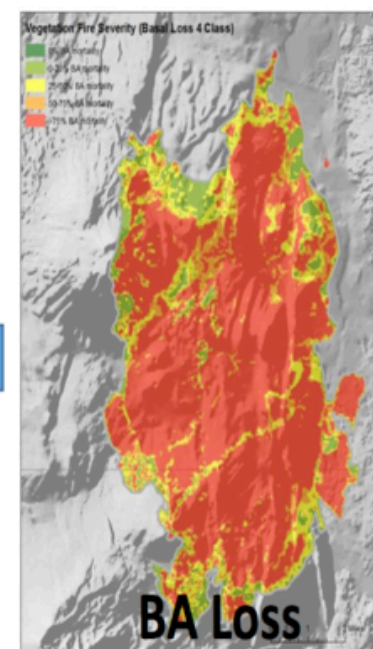
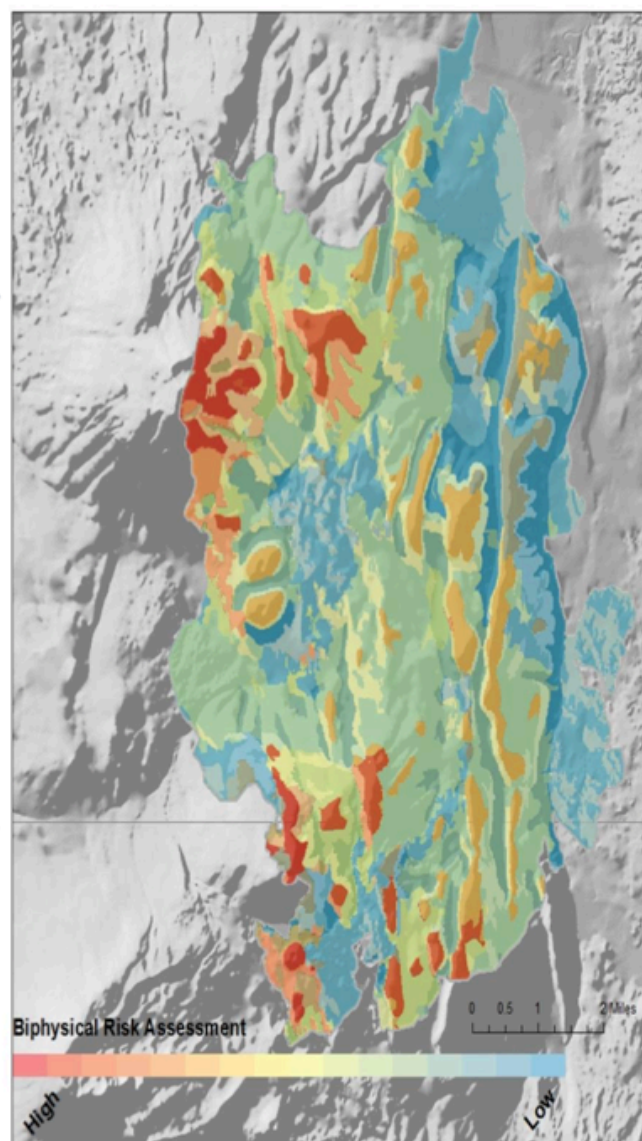
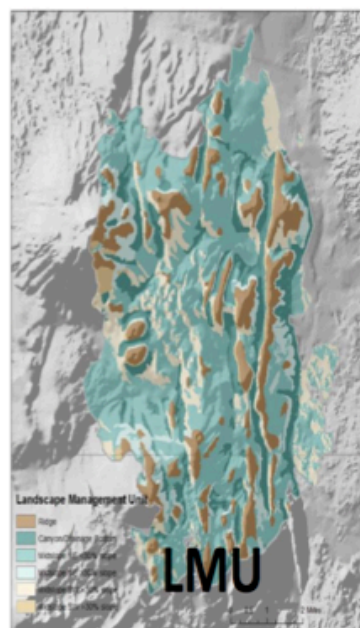
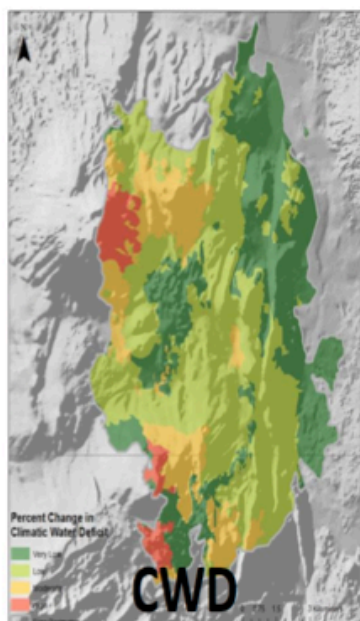
Unifying Principals

1. Relevant Landscape Context
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Step 1: Spatial Assessment





Step 2: Prioritization

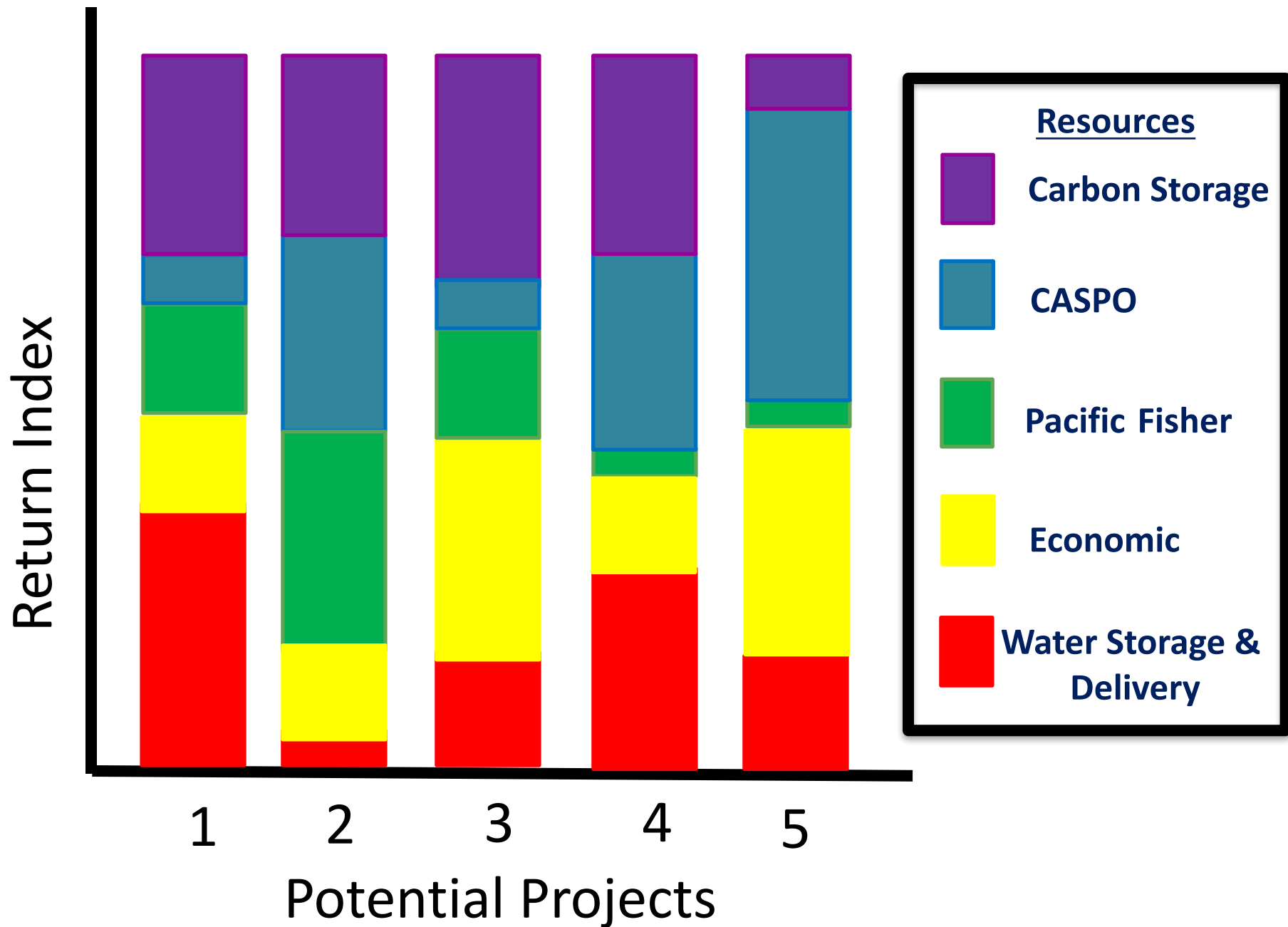
Review
Assessment
to Maximize
Return

ID Focal
Resources

Develop/Re
view
Decision
Tree*

Prioritize
Resources
and
Locations





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Start: Assessment can be used to address:
Are disturbance effects within NRV and
will **future vegetation conditions** approach
desired conditions?

Biophysical context, Forest Assessment

A: Are other stressors
operating that could effect
long-term resilience and
sustainability?

Climate, Invasive species, grazing,
insects/disease, etc.

I: Opportunities to
enhance long-term
ecological resilience and
sustainably.

Fire regime restoration,
management for passive recovery,
etc.

B: Can management actions restore desired
conditions?

Ecological function, structure, composition, etc.,

II. Opportunities for
management actions to
restore desired
conditions.

Reforestation, fuel trts,
climate smart approaches,

I: Can management
actions be changed to
increase effectiveness
under changed
conditions?

New or experiments
techniques be used to address
novel situations?

III: Reconsider desired conditions considering
climate change and other interactive stressors.

Restoration of desired conditions may not be feasible but some
ecosystem services may be sustained .

Step 2: Prioritization

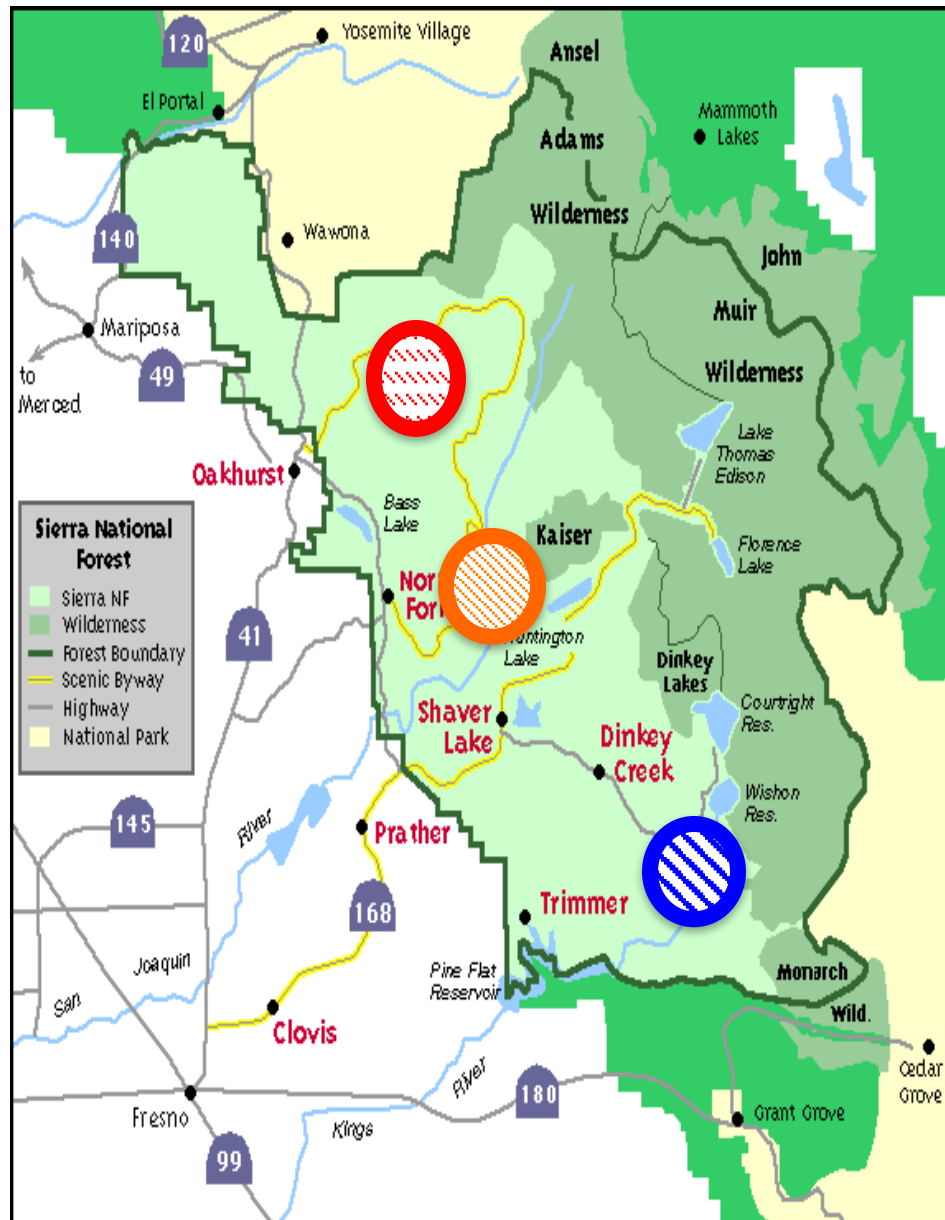
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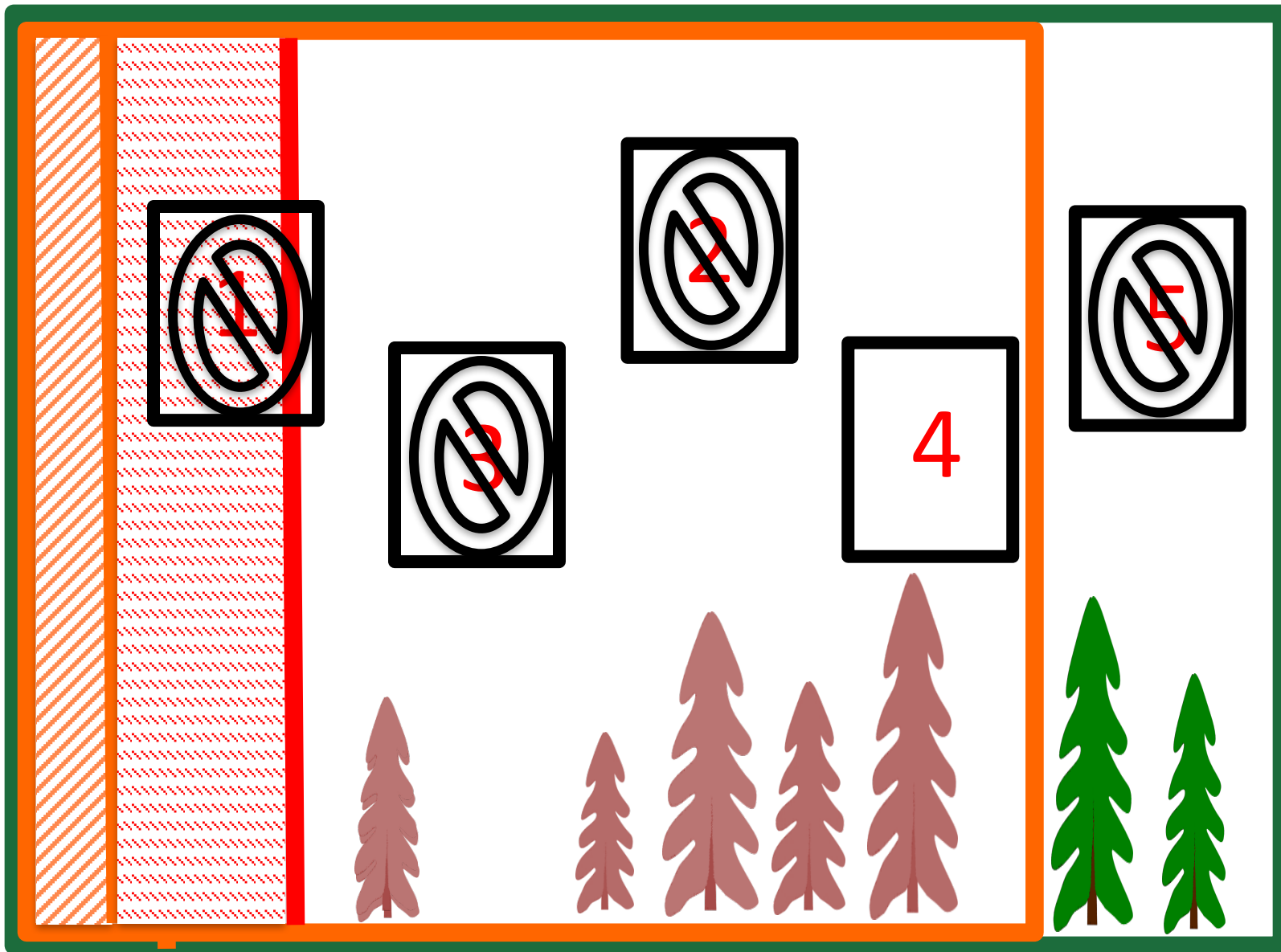
Prioritize Resources and Locations

- Decision Support Tool

Good

Better

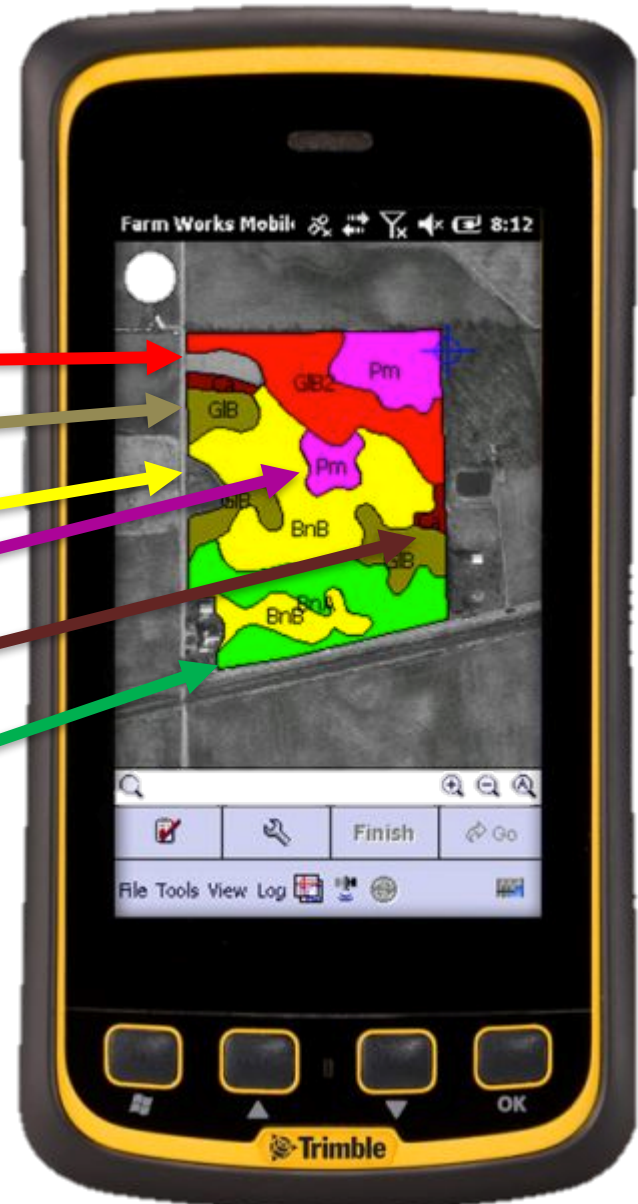
Best



Reforestation

Climate Futures Driven

- Do not plant
- Black Oak
- Ponderosa Pine
- Sugar Pine
- White Fir
- Incense Cedar



Climate Change and Resource Management

Managing in the face of uncertainty requires a portfolio of approaches, including short-term and long-term strategies, that focus on enhancing ecosystem resistance and resilience as well as assisting forested ecosystems to adapt to the inevitable changes as climates and environments continue to shift.

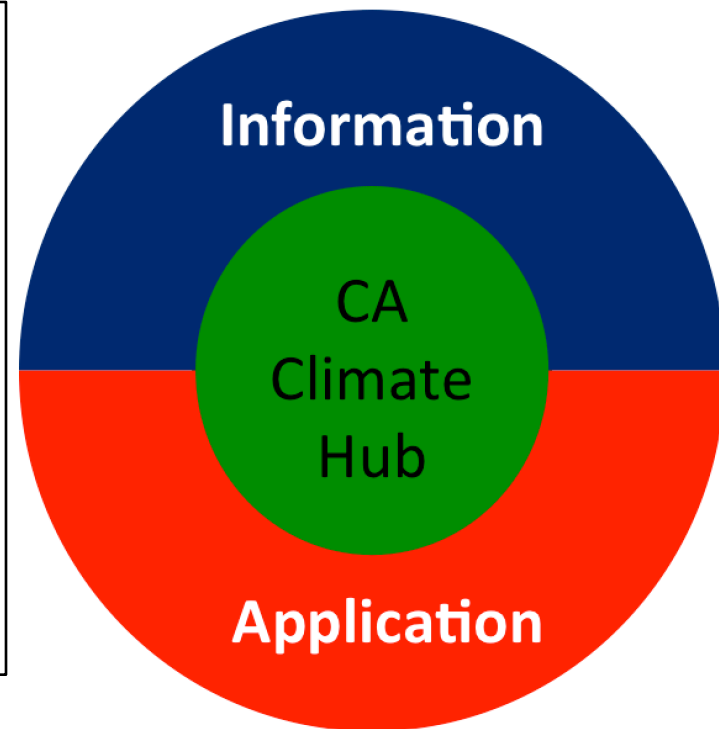
Questions, Comments or Thoughts?

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<http://www.climatehubs.oce.usda.gov/california>



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